

Lesson 3-4

Example 1

Divide a line segment into two segments of equal length.

Solution

Step 1: Start with a line segment, \overline{XY} .

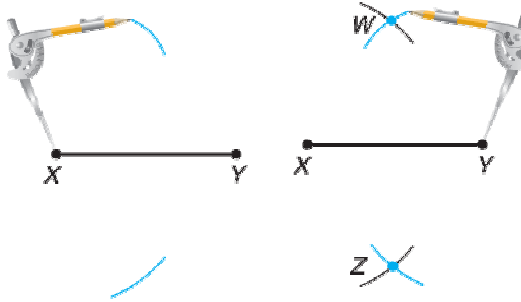
Step 2: Open the compass to a radius that is more than half XY . With the compass tip at X , draw one arc above and one arc below \overline{XY} .

Step 3: Place the compass at Y . Using the same radius as in Step 2, draw arcs above and below \overline{XY} .

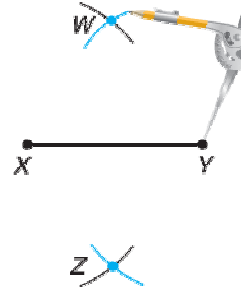
Step 4: Label the points where the two pairs of arcs intersect W and Z . Using a straightedge, draw \overline{WZ} . Label the point where \overline{WZ} intersects \overline{XY} as point M . This is the midpoint of \overline{XY} .



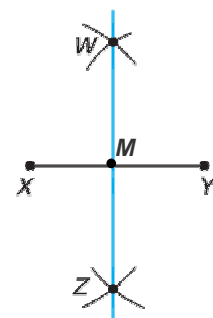
Step 1



Step 2



Step 3



Step 4

Example 2

ARCHITECTURE On the plans for a building, the angle of the roof is bisected by a length of decorative molding. Draw the bisector using a compass and a straightedge.

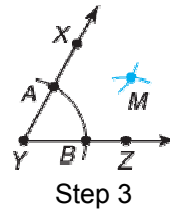
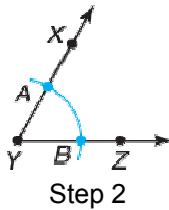
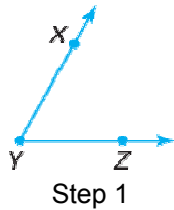
Solution

Step 1: Start with an angle $\angle XYZ$.

Step 2: With the compass point at Y , draw an arc that intersects \overline{YX} and \overline{YZ} . Label the points of intersection A and B .

Step 3: Use a radius that is more than half AB . Place the compass tip at A . Draw an arc in the interior of $\angle XYZ$. With the compass set to the same radius, place the compass tip at B and draw an arc that intersects the first arc. Label the point of intersection M .

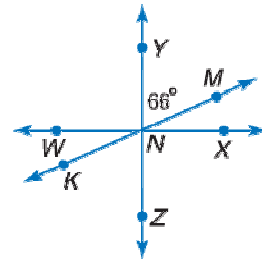
Step 4: Using a straightedge, draw \overline{YM} . This is the bisector of $\angle XYZ$.

**Example 3**

In the figure, $\overline{WX} \perp \overline{YZ}$. Find $m\angle WNK$.

Solution

Since $\overline{WX} \perp \overline{YZ}$, $\angle YNX$ is a right angle. The exterior sides of $\angle YNM$ and $\angle MNX$ form a right angle, so the angles are complementary. So, $66^\circ + m\angle MNX = 90^\circ$, and $m\angle MNX = 90^\circ - 66^\circ = 24^\circ$. Because $\angle WNK$ and $m\angle MNX$ are vertical angles, $m\angle WNK = m\angle MNX$. So, $m\angle WNK = 24^\circ$.



Example 4

In the figure, $\overline{GH} \parallel \overline{JK}$. Find $m\angle HQR$.

Solution

Since $\angle PQG$ and $\angle QRJ$ are corresponding angles, they are equal in measure.

$$m\angle PQG = m\angle QRJ$$

$$4n + 30 = 8n - 50$$

$$30 = 4n - 50$$

$$80 = 4n$$

$$20 = n$$

Add $-4n$ to each side.

Add 50 to each side.

Divide each side by 4.

Substituting 20 for n , $m\angle PQG = (4 \cdot 20 + 30)^\circ = (80 + 30)^\circ = 110^\circ$.

Since $\angle PQG$ and $\angle HQR$ are vertical angles, $m\angle HQR = 110^\circ$.

